Ziziphus mauritiana

Jøker, Dorthe

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Ziziphus mauritiana Lam.

Taxonomy and nomenclature
Family: Rhamnaceae
Synonyms: *Rhamnus jujuba* L., *Ziziphus jujuba* Lam.
Vernacular/common names: ber, Chinese date, desert apple, Indian cherry, Indian jujube, Indian plum, jujube (English); kurkura (Amharic); sidr (Arabic); ber, ber boroi, boroi, kool (Bengali); eng-si, zee-pen (Burmese); manzanita (Filipino); jujubier, liane croc-chien (French); Indischer Jujubenstrauch (German); baer, ber (Hindi); bidara, dara, widara (Indonesian); putrea (Khmer); than (Lao); bidara, epal siam, jujub (Malay); toboro, tomboron moussana, tomborongo (Mandinka); bayer (Nepali); ajapriya, badara, kar-kandhu, kuvala, madhuraphala (Sanskrit); geb, gub (Somali); perita haitiana, Ponseré, yuyuba (Spanish); mkunazi (Swahili); elandai, yellande (Tamil); ma tan, ma thong, phutsan (Thai); geva (Tigrigna); c[aa]y t[as]o ta, tao, tao nhuc (Vietnamese); jujube (trade name).

Distribution and habitat
Native to South and Central Asia and China and naturalised in a large number of tropical and subtropical countries. It is a very hardy species that withstands salinity and drought as well as waterlogging. It is found growing up to 1500 m altitude but commercial cultivation usually only extends up to 1000 m altitude. It can survive temperatures as high as 50ºC and down to 7ºC but does not tolerate frost.

Uses
A multipurpose tree that provides both fruit, fodder and fuel. The fruits are usually eaten fresh, they have a high content of vitamin C and are very nutritious. They can also be dried, candied, pickled or used to make juice or ber butter. In Indonesia the young leaves are cooked as a vegetable. In parts of India and North Africa the leaves are used as fodder for sheep and goats. The timber is hard with a density of 535-1080 kg/m^3 and is used for a number of purposes where a durable, close-grained wood is needed. It makes good charcoal with a heat content of almost 4.900 kcal/kg and is also used as firewood in many areas. The thorny tree makes excellent fencing that deters livestock as well as wild animals such as baboons. In India and Pakistan it is an important agroforestry and silvipasture species in arid and semi-arid areas. It is also planted for erosion control, soil and river-bank stabilisation and land reclamation.

Botanical description
Evergreen shrub or tree up to 15 m tall and up to 40 cm in diameter. The leaves are alternate and elliptic, 2.5-3.2 cm long and with three distinct veins. In the leaf-corners are two spines, one long and straight the other small and curved. Although most trees bear spines, spineless individuals are not uncommon. Flowers are small and bisexual, yellow or greenish, borne on short stalks, 2-3 together in the leaf-corners.

Fruit and seed description
The fruit is a drupe with a fleshy pulp and a single, hard stone. It is very variable in shape and size but most are round to oval. Fruits from wild trees can be as small as 1.8-2.5 cm while improved cultivars bear fruits as large as 5 cm in diameter. Both texture and taste of the pulp is similar to apples. The stone has irregular furrows and it normally contains two brown seeds with a papery seedcoat. Seed weight varies and there can be from 500 up to 3300 stones per kg.

Mature fruits of *Ziziphus mauritiana*. From: Morton (1987)

Flowering and fruiting habit
The trees can be evergreen or deciduous but except in dry areas, they remain leafless for only a short period. In India the trees flower in July to October and fruits are formed soon after. In February-March the fruits are mature and in some places a second crop is produced in the fall. In the wild, fruiting normally begins when the trees are 3-4 years old and usually a good crop is produced every year. The flowers are pollinated by ants and other insects, and in the wild state the trees do not set fruits by self-pollination. Most cultivars, however, can produce fruits without cross-pollination. The seeds are dispersed by birds and animals.

Harvest

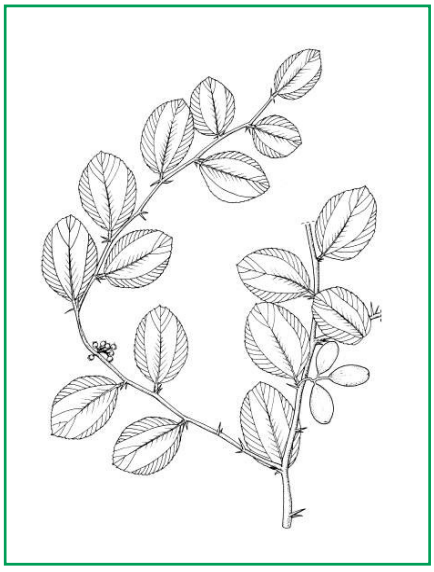
The immature fruit is green in color, but as it ripens it goes through a yellow-green stage with mahogany-colored spots appearing on the skin as the fruit ripens further. The fully mature fruit is entirely red and the pulp becomes soft and wrinkled. The fruits are picked directly from the tree and only fully mature fruits should be collected. They should be transported in open bags to avoid fermentation.

Processing and handling

After collection the fruits are macerated in water to remove the pulp and the stones are rinsed in clean water. Empty stones can easily be separated by flotation in a 18% solution of ordinary cooking salt. Then the stones are spread out on a sheet and dried in the sun for one week.

Storage and viability

The seeds are orthodox and should be stored at low moisture content (7-10%) in air-tight containers. At room temperature the seed can be expected to store for at least one year. In cold store at 5ºC the seed will retain high viability for several years.



Flowering and fruiting branch. Copyright: PROSEA Foundation

Dormancy and pretreatment

Germination often improves after the seed has been stored for some months. The hard stone restricts germination and cracking the shell or extraction of seeds fastens germination.This can be done using a vice but the seed inside is fragile and apart from being very time-consuming, removal of the shell can damage the seed. Without pretreatment the seeds normally germinate within six weeks whereas extracted seeds only need one week to germinate. Germination percentage is high both for treated and untreated seeds. Before sowing, the seeds are soaked in water for two days.

Sowing and germination

The seeds need light to germinate and it is not recommended to shade the seedbeds. They can be sown directly into containers or in germination trays or seedbeds and transplanted into containers when they have developed the first pair of permanent leaves. The seedlings may need as long as 15 months in the nursery before planting in the field. Great care must be taken when transplanting nursery stock to the field because of the long taproot. In general, stump planting is more successful than using bare-rooted stock. The stumps should consist of approximately 25 cm of root and 5-7.5 cm shoot. Alternatively the seeds can be sown directly in the field. Horticultural cultivars are normally grafted onto wild type seedling root stocks either in the nursery or in the field. Spacing should be 3x3 m for fodder production and windbreaks. For orchard establishment the recommended spacing is 7x7 or 8x8 m.

Selected readings

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Author: Dorthe Jøker, DFSC

Danida Forest Seed Centre
Krogerupvej 21
DK-3050 Humlebaek
Denmark

Phone: +45-49190500
Fax: +45-49160258
Email: dfsc@sns.dk
Website: www.dfsc.dk